Spot Safety Project Evaluation

Project Log # 200611061

Spot Safety Project # 10-01-203

Spot Safety Project Evaluation of the Traffic Signal Revision At the Intersection of SR 1009 (Old Charlotte/Old Monroe) and SR 1377 (Wesley Chapel-Stouts)
Union County

Documents Prepared By:

Safety Evaluation Group
Traffic Safety Systems Management Section
Traffic Engineering and Safety Systems Branch
North Carolina Department of Transportation

Principal Investigator

_____ 9/12/2007
Brad Robinson, EI Date

Traffic Safety Project Engineer

Spot Safety Project Evaluation Documentation

Subject Location

Evaluation of Spot Safety Project Number 10-01-203 – The Intersection of SR 1009 (Old Charlotte/Old Monroe) and SR 1377 (Wesley Chapel-Stouts) in Union County.

Project Information and Background from the Project File Folder

The spot safety project improvement countermeasure chosen for the subject location was the revision of the signal phasing in order to provide protected/permitted phasing for the northbound approach of SR 1377 and for the westbound approach of SR 1009. In the study period all approaches had a single through lane and a left turn lane, with speed limits of 45 mph. After reviewing crashes at this location and conducting a field investigation it was observed that this intersection underwent further construction in late 2005. A right turn lane has been constructed on eastbound SR 1009 and protected/permitted phasing has been added to the other two approaches. A raised center median has also been constructed along the eastbound approach of SR 1009, extending beyond the study limits.

The original statement of problem was that the signal revision was needed in order to alleviate congestion at the intersection.

The initial crash analysis was conducted from July 1, 1997 to July 1, 2000 with a total of 15 crashes, none of which were considered correctable by the chosen countermeasure. The final completion date for the improvements at the subject intersection was on June 30, 2002 with a total cost of $20,000.00.

Naive Before and After Analysis

After reviewing the spot safety project file folder along with all the crashes at the subject location, the crash data omitted from this analysis to consider for an adequate construction period was from May 1, 2002 to August 31, 2002. The before period consisted of reported crashes from February 1, 1999 through April 30, 2002 (3 years and 3 months) and the after period consisted of reported crashes from September 1, 2002 through November 30, 2005 (3 years and 3 months). The ending date for this analysis was limited due to the construction at the intersection mentioned in the *Project Background* section

The treatment data consisted of all reported crashes within 150 feet of the subject intersection. The following data table depicts the Naive Before and After Analysis for the treatment location. Please note Left Turn-Same Roadway Crashes involving left turning traffic from either northbound SR 1377 or westbound SR 1009 were the target crashes for the applied countermeasure.

Treatment Information			
	Before	**After**	**Percent Reduction (-) Percent Increase (+)**
Total crashes	19	24	26.3
Total Severity Index	3.73	4.08	9.4
Target Crashes	3	5	66.7
Target Crash Severity Index	3.47	6.92	99.4
Volume	7600	8400	10.5
Crash Severity Summary			
Fatal Crashes	0	0	N/A
Class A Crashes	0	0	N/A
Class B Crashes	1	3	200.0
Class C Crashes	6	7	16.7
PDO Crashes	12	14	16.7

The naive before and after analysis at the treatment location resulted in a 26 percent increase in Total Crashes, a 67 percent increase in Target Crashes, and an 11 percent increase in Average Daily Traffic (ADT). The before period ADT year was 2000 and the after period ADT year was 2004.

Results and Discussion

The naive before and after analysis involving the comparison of treatment actual before data versus treatment actual after data resulted in a 26 percent increase in Total Crashes and a 67 percent increase in Target Crashes. The Total Severity Index increased by 9 percent and the Target Crash Severity Index increased by 99 percent. The summary results above demonstrate that both Total Crashes and Target Crashes appear to have increased at the treatment location from the before to the after period.

One of the five after period Target Crashes involved a northbound vehicle on SR 1377 turning left with a green arrow and getting hit by a through vehicle that ran a red light.

Referencing the *After Period Collision Diagram*, it appears that the only crashes occuring in the intersection during the after period are Left-Turn-Same Roadway Crashes, although there are no crash patterns that stand out above the rest.

The increase in crashes at the intersection could be attributed to the increase in traffic. It appears that development has been increasing in the vicinity of the subject intersection in the past few years. After conducting a field investigation it was observed that a CVS pharmacy was in the northwest quadrant of the intersection that was not in a March 2004 aerial photo (Note: the CVS has no driveways within 150 feet of the intersection). Although the after period median year ADT of 2004 was used for this analysis, 2005 ADT maps show that traffic has greatly increased on at least one

leg. For the northbound leg of SR 1377 a 2004 map shows an ADT of 7,200, while a 2005 map shows an ADT of 14,000 for the same leg.

The calculated benefit to cost ratio for this project is –5.8 considering total crashes. The benefit to cost ratio considering only target crashes is –4.7. The benefits are calculated using the change in annual crash costs from the before to the after period. Operational and other benefits related to the project are not considered in this analysis. The costs of the project include the actual construction costs as well as the increase in annual maintenance and utility costs.

As the Safety Evaluation Group completes additional spot safety reviews for this type of countermeasure, we will be able to provide objective and definite information regarding actual crash reduction factors for this type of roadway.

BENEFIT-COST ANALYSIS WORKSHEET

LOCATION: SR 1009 at SR 1377 BY: Brad Robinson
COUNTY: Union DATE: 8/30/2007
FILE NO.: SS 10-01-203

DETAILED COST: TYPE IMPROVEMENT - Signal Revision - Added protected left turns for NB and WB approaches

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	$20,000	10	0.149	$2,981
	$0	0	0.000	$0
Right-of-Way	$0	0	0.000	$0
TOTALS	$20,000	10	0.149	$2,981

ESTIMATED INCREASE IN ANNUAL MAINT. COST = $0
ESTIMATED INCREASE IN ANNUAL UTILITY COST = $300

TOTAL ANNUAL COST= $3,281
TOTAL COST OF PROJECT= $20,000

COMPREHENSIVE COST REDUCTION:

		ESTIMATED NUMBER OF ANNUAL ACCIDENT DECREASES						
TIME PERIOD	YEARS	K & A CRASHES	K & A CRASHES PER YR	B & C CRASHES	B & C CRASHES PER YR	PDO CRASHES	PDO CRASHES PER YR	ANNUAL COSTS
BEFORE	3.25	0	0.00	7	2.15	12	3.69	$53,169
AFTER	3.25	0	0.00	10	3.08	14	4.31	$72,185

Annual Benefits from Crash Cost Savings ($19,015)

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = ($22,296)

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = -5.80

TOTAL COST OF PROJECT - $20,000 COMPREHENSIVE B/C RATIO - -5.80

BENEFIT-COST ANALYSIS WORKSHEET TARGET

LOCATION: SR 1009 at SR 1377 BY: Brad Robinson
COUNTY: Union DATE: 8/30/2007
FILE NO.: SS 10-01-203

DETAILED COST: TYPE IMPROVEMENT - Signal Revision - Added protected left turns for NB and WB approaches

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
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	$0	0	0.000	$0
Right-of-Way	$0	0	0.000	$0
TOTALS	$20,000	10	0.149	$2,981

ESTIMATED INCREASE IN ANNUAL MAINT. COST = $0
ESTIMATED INCREASE IN ANNUAL UTILITY COST = $300

TOTAL ANNUAL COST= $3,281
TOTAL COST OF PROJECT= $20,000

COMPREHENSIVE COST REDUCTION:

ESTIMATED NUMBER OF ANNUAL ACCIDENT DECREASES

TIME PERIOD	YEARS	K & A CRASHES	K & A CRASHES PER YR	B & C CRASHES	B & C CRASHES PER YR	PDO CRASHES	PDO CRASHES PER YR	ANNUAL COSTS
BEFORE	3.25	0	0.00	1	0.31	2	0.62	$7,938
AFTER	3.25	0	0.00	4	1.23	1	0.31	$23,354

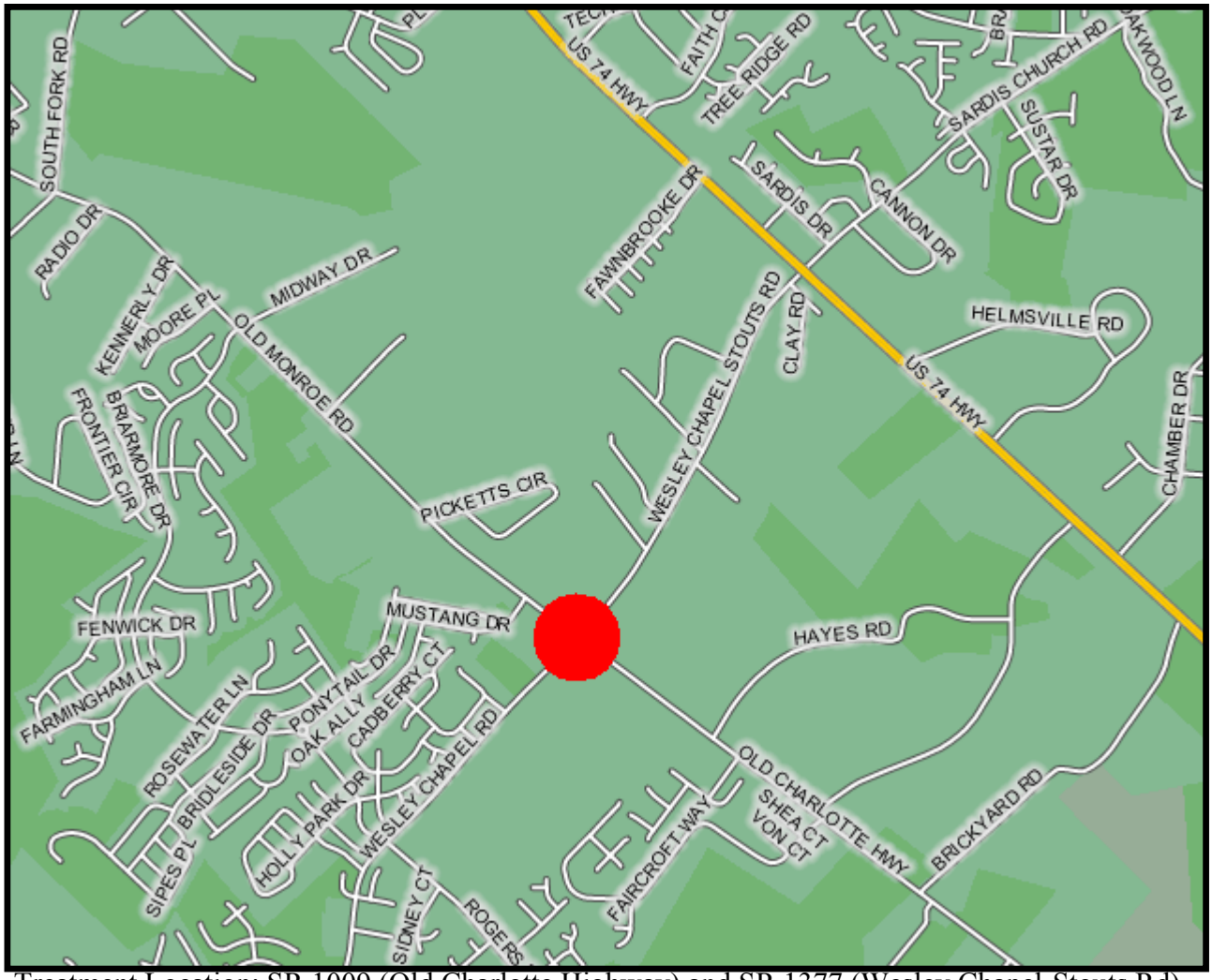
Annual Benefits from Crash Cost Savings ($15,415)

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = ($18,696)

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = -4.70

TOTAL COST OF PROJECT - $20,000 COMPREHENSIVE B/C RATIO - -4.70

Location Map
Union County
Evaluation of Spot Safety Project #10-01-203



Treatment Location: SR 1009 (Old Charlotte Highway) and SR 1377 (Wesley Chapel-Stouts Rd)

Treatment Site Photos Taken July 11, 2007

(Note intersection has changed since study time period)

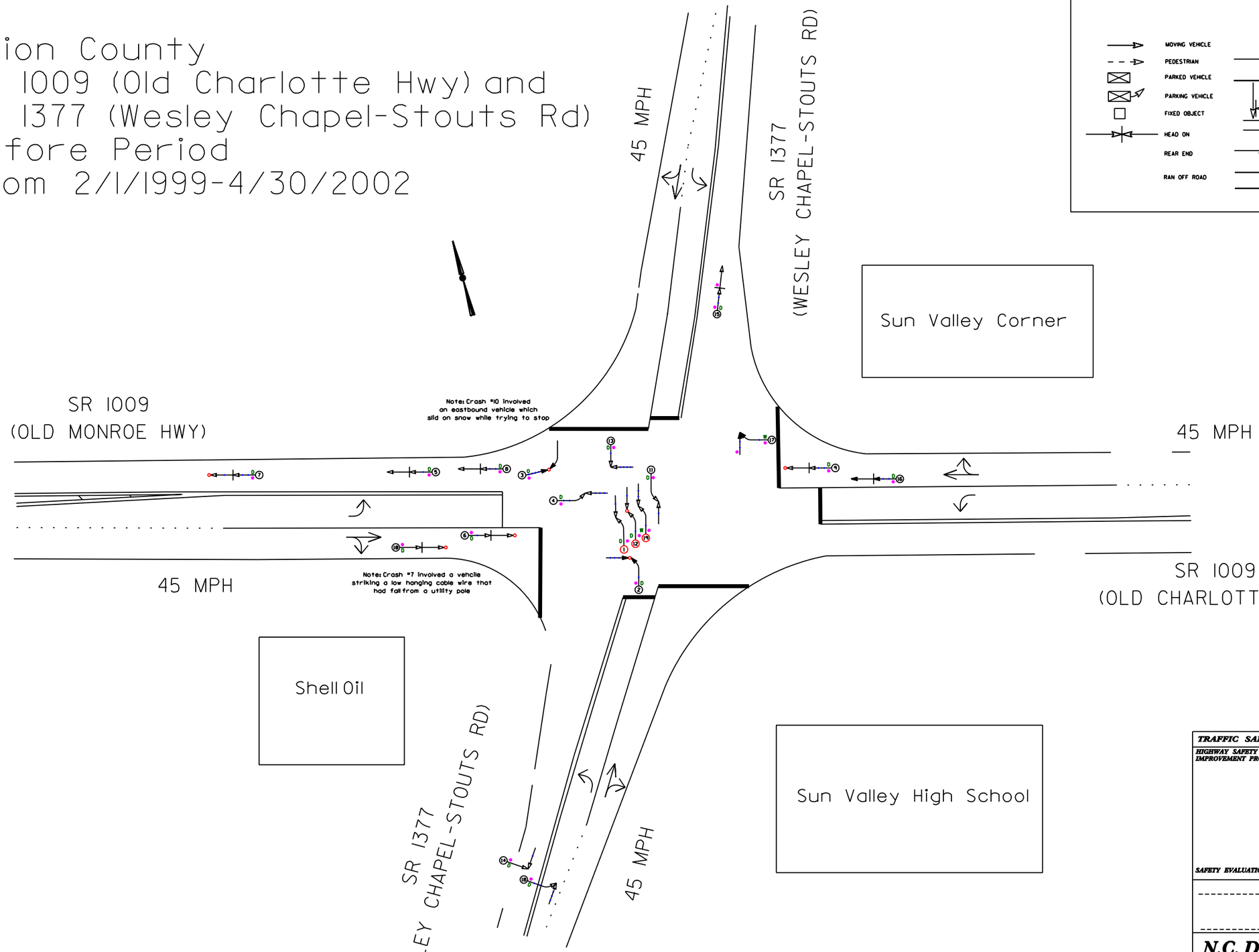
Driving East on SR 1009 (Old Monroe) *(Right Turn Lane was not present in study period)*

Driving West on SR 1009 (Old Charlotte)

Driving North on SR 1377 (Wesley Chapel-Stouts)

Driving South on SR 1377 (Wesley Chapel-Stouts)

Union County
SR 1009 (Old Charlotte Hwy) and
SR 1377 (Wesley Chapel-Stouts Rd)
Before Period
From 2/1/1999-4/30/2002



LEGEND

MOVING VEHICLE
PEDESTRIAN
PARKED VEHICLE
PARKING VEHICLE
FIXED OBJECT
HEAD ON
REAR END
RAN OFF ROAD

ANGLE
TURNING
BACKING
SIDESWIPE
OUT OF CONTROL
INJURY
FATALITY

9 MPH OR LESS
10 MPH TO 19
20 MPH TO 29
30 MPH TO 39
40 MPH TO 49
50 MPH TO 59
60 MPH TO 69
70 AND UP
SPEED UNKNOWN
DAYLIGHT CRASH
DARK CRASH

P PEDESTRIAN
B BICYCLE
T TRAIN
A ANIMAL
* DRIVER AT FAULT
D DRY
W WET
I ICY OR SNOWY

TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

HIGHWAY SAFETY IMPROVEMENT PROGRAM | SAFETY INFORMATION MANAGEMENT AND SUPPORT

SAFETY EVALUATION | TRAFFIC SAFETY

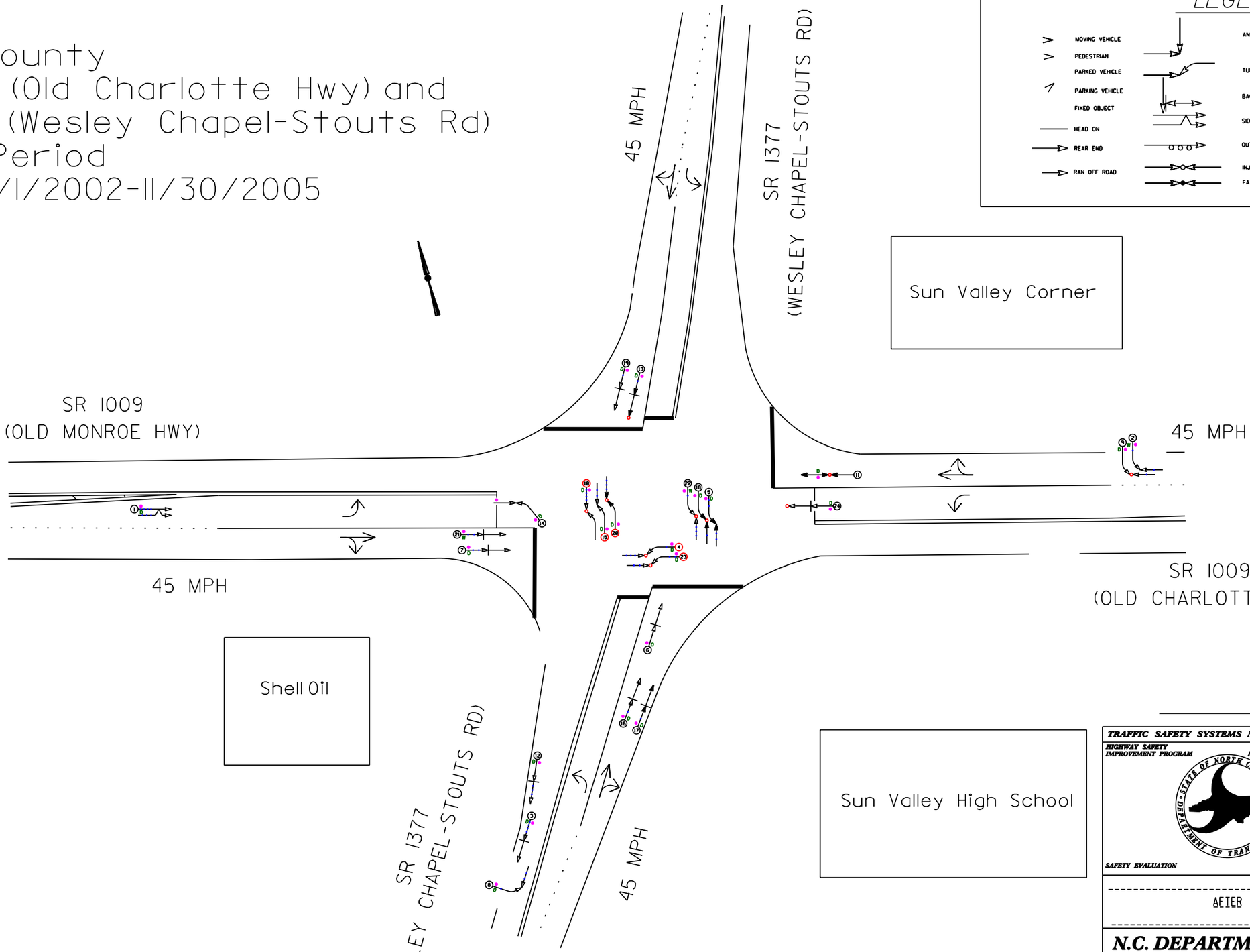
BEFORE

COLLISION DIAGRAM

DIVISION: 12	AREA: ..
STUDY PERIOD: 2/1/1999 TO 4/30/2002	
DISTANCE:	Y-LINE: 150 FT
ANALYSIS PREPARED BY: B. Robinson	
DIAGRAM PREPARED BY: B. Robinson	
DIAGRAM REVIEWED BY: ----------	
SCALE:	NOT TO SCALE
DATE:	June 2007
LOG NUMBER:	20061106I

N.C. DEPARTMENT of TRANSPORTATION
DIVISION of HIGHWAYS
TRAFFIC ENGINEERING AND SAFETY SYSTEMS BRANCH

Union County
SR 1009 (Old Charlotte Hwy) and
SR 1377 (Wesley Chapel-Stouts Rd)
After Period
From 9/1/2002-11/30/2005



LEGEND

MOVING VEHICLE
PEDESTRIAN
PARKED VEHICLE
PARKING VEHICLE
FIXED OBJECT
HEAD ON
REAR END
RAN OFF ROAD

ANGLE
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TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT
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SAFETY INFORMATION MANAGEMENT AND SUPPORT
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AFIER

COLLISION DIAGRAM

DIVISION: 12	AREA: ..
STUDY PERIOD: 9/1/2002 TO 11/30/2005	
DISTANCE:	Y-LINE: 150 FT
ANALYSIS PREPARED BY: B. Robinson	
DIAGRAM PREPARED BY: B. Robinson	
DIAGRAM REVIEWED BY: _____	
SCALE:	NOT TO SCALE
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